

JOINTING SYSTEM FOR WALL-BUILDING PIECES

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(54) SYSTÈME D'ASSEMBLAGE DE PIÈCES DE CONSTRUCTION DE MURS

(54) JOINTING SYSTEM FOR WALL-BUILDING PIECES

(57)

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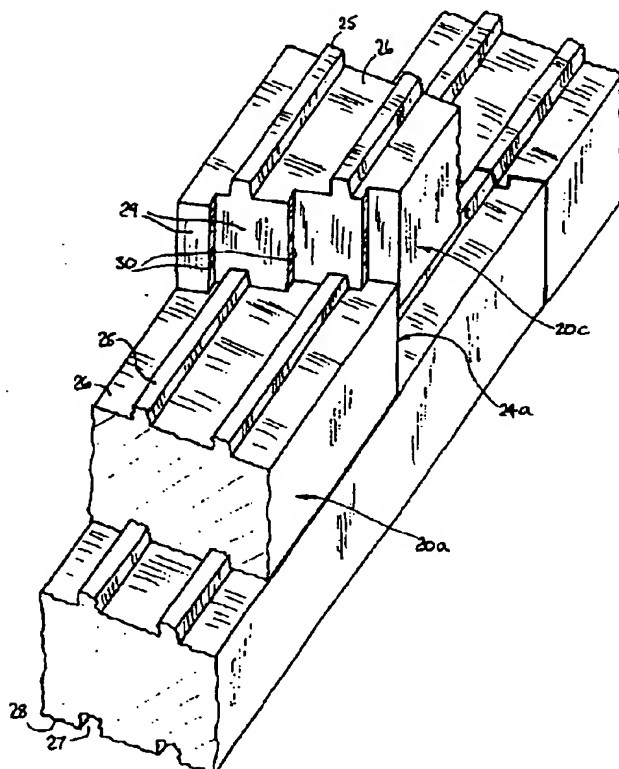
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(54) **SYSTEME D'ASSEMBLAGE DE PIECES DE CONSTRUCTION
DE MURS**

(54) **JOINTING SYSTEM FOR WALL-BUILDING PIECES**



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Abstract of the Disclosure

The logs for a log-cabin wall are joined in interlocking end-to-end abutment. Each log has an end-face, which includes a re-entrant platform. All surfaces on the end-face, including the platforms and the block-surfaces between, face one way, i.e either towards the inside, or towards the outside, of the wall. All the surfaces on the end-face of the interlocking end-face of the adjoining log face the other way. The logs are positioned laterally by means of spline-in-groove engagements with the logs above and below. The platforms are flat, parallel, and perpendicular to the block surfaces, whereby the end-face can be formed by simple saw-cuts. The spline in the log below serves as a watershed to prevent water passing inside, and the re-entrant platform is placed outside the watershed, and includes channels to collect water in the joint, and convey it back outside the wall.

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1 Title: JOINTING SYSTEM FOR WALL-BUILDING PIECES

2
3
4 This invention is applicable for use in joining wood-pieces in
5 building construction, for example in buildings of the log-cabin
6 type, for joining logs end-to-end.
7

8
9 BACKGROUND TO THE INVENTION

10
11 It is the common practice in the construction of modern log
12 cabins, to manufacture the logs to the final size and shape in-
13 factory, and to ship the finished logs for assembly on site. It
14 is conventional to provide a means for securing the rows or
15 courses of logs to the courses of logs above and below. This is
16 done by means, for example, of a spline and groove engagement.
17 It is also conventional to clamp the logs together vertically by
18 means of long through-bolts that pass through holes pre-drilled
19 in the logs.
20

21 Given that the walls of buildings are longer than the logs, the
22 logs need to be joined end to end, in butt-joints. One of the
23 difficulties of conventional factory-made log cabin construction
24 is that it has been difficult to keep the end-faces of the logs
25 together at the joints, and to stop the logs from separating, and
26 gaps from opening, at the joints. As the joints open, the joints
27 become no longer weather-tight.
28

29 It might be considered that the way to keep the butt-joints held
30 tightly together, and to resist separation at the joints, would
31 be to use dovetails. While dovetail joints possible might hold
32 the logs together, they would be hopelessly uneconomical because
33 dovetail joints are far too difficult to assemble, and the
34 dovetail shape cannot be formed in one pass of a saw-blade type
35 of cutter. Dovetail joints would require several passes of a
36 saw-blade (each cut requiring the log and the saws to be re-set)
37 or would require the use of a routing process, which would be far
38 too slow to be contemplated on a mass-production basis.
39

40 The invention aims to provide a butt-joint that compares as to
41 physical security with a dovetail joint, but which is far easier

(and less costly) to manufacture and assemble.

The invention also aims to provide a butt-joint that offers excellent weather protection.

The invention aims to be applicable to walls made of pieces of wood, in the form of logs as in a log cabin; in the form of siding; and in the form of large-area sheets. It is an aim that the shapes provided at the joints are easy to cut, using simple machinery.

THE PRIOR ART

Splines and grooves in the upper and lower surfaces are shown in (for example) US-5,638,649 (Hovland, June 1997). A system for butt-jointing logs, in which shaped slots are cut in the logs, and complementarily-shaped pegs are driven through the slots, is shown in US-5,020,289 (Wrightman, June 1991).

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

By way of further explanation of the invention, exemplary embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Fig 1 is a plan view of a portion of a wall of a log cabin, which embodies the invention;

Fig 2 is a pictorial view of the portion of the wall of Fig 1;

Fig 3 is a diagram illustrating a saw-cutting operation during the manufacture of the logs shown in Fig 1;

Fig 4 is a pictorial view of a portion of another wall;

Fig 5 is a pictorial view of two courses (shown separated) of logs, showing a corner in another wall;

Fig 6 is a close-up of a joint between two logs;

Fig 6a shows the joint of Fig 6 with the logs separated;

Fig 7 is the same view as Fig 5 of an alternative construction;

Fig 8a is a side elevation of a wall, shown to illustrate the terminology used;

Fig 8b is a plan view of some pieces of the same wall;

1 Fig 8c is a pictorial view of one of the pieces of the wall;
2 Fig 9 is a plan view of a prior art system.

3
4 The apparatuses shown in the accompanying drawings and described
5 below are examples which embody the invention. It should be
6 noted that the scope of the invention is defined by the
7 accompanying claims, and not necessarily by specific features of
8 exemplary embodiments.

9
10 Fig 1 is a plan view of a wall which comprises several rows or
11 courses of logs. The portion of the course 20 of the wall shown
12 in Fig 1 comprises a log 20a, having a left end-face 23a and a
13 right end-face 24a. The log 20b to the left has a corresponding
14 right end-face 24b, and the log 20c to the right has a
15 corresponding left end-face 23c. The end faces are shaped as
16 shown, and are in end-to-end interlocking configuration.

17
18 Each log has splines 25 on its upper surface 26, and
19 corresponding grooves 27 on its lower surface 28. The splines
20 and grooves engage with corresponding grooves and splines in the
21 logs of the respective courses above and below. Since the
22 courses of logs are resting on each other under gravity in a
23 vertical stack, the engagement of the grooves and splines keeps
24 the logs from moving laterally relative to the logs above and
25 below.

26
27 Log 20a is prevented from separating lengthwise, or
28 longitudinally, with respect to adjacent log 20b by virtue of the
29 shapes of the end faces 23a and 24b. It will be understood that,
30 because of the interlocking shapes of the end-faces 23a and 24b,
31 the logs 20a, 20b, 20c, in order to separate longitudinally, would
32 have to move laterally; but the logs cannot move laterally. Logs
33 20a, 20b, 20c cannot move laterally relative to each other because
34 of their splines-to-grooves engagement with the logs in the
35 courses above and below. The designer should ensure that the
36 breaks between the logs in the courses above and below do not
37 coincide with the breaks in the course 20.

38
39 Fig 2 shows the manner of assembling the wall. The log 20a is
40 already in place, resting in spline-to-groove engagement on the
41 logs in the course below. To assemble the next or junior log 20c

1 in the course, the end-face 23c of the log 20c is placed to
2 engage with the end-face 23a of the already-placed or senior log
3 20a. Preferably, the junior log should be carefully engaged face
4 to face, but with the junior log at first held vertically clear
5 of splines-to-grooves engagement with the logs below. After
6 checking that the junior log is aligned correctly, the junior log
7 is lowered to its assembled final position.

8
9 The nature of the engagement of the logs, in fact, is such that
10 the junior log cannot be assembled partially; either the junior
11 log 20c is fully and properly engaged with the senior log 20a in
12 the same course, and with the logs in the course below, or the
13 junior log is so far out of engagement that its out-of-engagement
14 status is unmistakably clear.

15
16 As shown in Fig 2, the end-face 23c comprises four block-surfaces
17 29, and three re-entrant platforms 30. The four block-surfaces
18 are all flat planes, which are parallel. Similarly, the three
19 re-entrant platforms 30 are all flat planes, which are parallel,
20 and the platforms 30 lie at right angles to the block-surfaces
21 29. It is the engagement of the re-entrant platforms 29 on end-
22 face 23c with the corresponding re-entrant platforms on the end-
23 face 24a that locks the logs 20a and 20c together against
24 possible separation in the longitudinal sense.

25
26 It may be noted that this engagement locks the logs together very
27 securely, and also locks them together right at the very ends.
28 Thus, any tendency of the logs to shrink, and therefore to
29 separate at the end-faces, is well resisted by the design as
30 shown. The more the logs shrink, the harder the re-entrant
31 platforms will press themselves together.

32
33 The splines 25 and grooves 27 may be given a slight draft or
34 taper, as shown. Thus, the logs are easy to assemble together,
35 and the engagement between the splines and grooves only becomes
36 tight at the very last. The designer can even choose to have the
37 fit of the splines to the grooves so tight that the logs have to
38 be finally hammered together.

39
40 Of course, the designer must see to it that the logs are cut to
41 shape accurately enough that the logs fit and engage properly

1 together. It is recognised that the accuracy required in the
2 cutting of the shapes of the logs is readily achieved using
3 conventional industrial methods. The grooves and splines, when
4 straight, can be cut with ordinary plain saw blades, and the
5 surfaces of the logs are cut each in a single pass by running the
6 logs lengthwise under the rotating blades. When tapered, the
7 grooves and splines are cut with respective specially-shaped saw
8 blade cutters, but again the surfaces are cut each in a single
9 lengthwise pass.

10
11 Fig 3 shows the saw-blade arrangement for cutting the end-faces
12 of the logs. Here, as shown, four blades 32 are ganged on a
13 single spindle 34. The cut is made by passing the saw-blades
14 through the log (or the log through the saw blades) in the
15 direction into the drawing. This system of shaping the end-face
16 is very accurate as regards the relationship between the
17 successive re-entrant platforms 30 on the end-face. The depth
18 setting of the saw-gang need only be set once, i.e the depth does
19 not need to be individually set, once for each platform.

20
21 As shown, the end-faces of the logs are symmetrical about a plane
22 of symmetry that is defined as the vertical plane passing through
23 the longitudinal axis of the log. This symmetry ensures that the
24 logs can be placed with either side surface of the log serving as
25 the outside of the wall. Thus, the builder can select and
26 assemble the logs so that their good sides all face outwards. On
27 the other hand, the end-faces might be made non-symmetrical,
28 deliberately so that the good side can be selected in-factory and
29 that selection enforced on the builder. (The splines and grooves
30 can be arranged non-symmetrically also, if desired.) However,
31 the logs from which houses are built are generally good both
32 sides; therefore, the designer can make assembly a little less
33 restrictive by specifying symmetry of the end-faces, and symmetry
34 of the splines and grooves.

35
36 It may be noted that the re-entrant platforms 30 and block-
37 surfaces 29 that make up the end-faces are all vertical. When a
38 junior end-face is properly assembled to an adjoining senior end-
39 face, the junior end-face does not rest upon, and is not
40 supported by, the senior end-face.
41

1 The platform 30 is re-entrant in that a line parallel to the
2 longitudinal axis of the log, and emerging from any point on the
3 re-entrant platform, is directed towards (i.e not away from) the
4 main bulk of that log.

5
6 Other shapes are contemplated for the end-faces, besides the
7 four-block-three-platform end-face as shown in Figs 1 and 2. In
8 Fig 4, for example, the end-face has three block surfaces and two
9 re-entrant platforms. This is more suitable when the logs are
10 much narrower in width than in height (in which case, the pieces
11 of wood now have the dimensions of siding or cladding, rather
12 than logs).

13
14 Fig 5 also illustrates the manner in which corners of the log
15 cabin building can be arranged. Two courses of logs are shown in
16 Fig 5. Corners require the provision of a special-log 36. The
17 special-log 36 is cut with a complementary three-block-two-
18 platform side-end-face 37, which fits the end-face 38 of log 39.
19 All the logs on the same course of logs have a common design of
20 end-face 38, both ends, apart from the special-log 36, of which
21 only one of its end-faces 40 is to the common design.

22
23 Gaskets 42 are provided for sealing the corners. Recesses 43,44
24 are cut in the logs 36,39, which combine to create an
25 accommodation for the gasket 42. The grooves 27 cut in the
26 undersurface of the special-corner-log 39 are ramped out, so as
27 not to leave in the outside surface thereof.

28
29 At the corners, a vertical hole 45 is provided right through all
30 the logs. A metal rod can be passed through the holes in all the
31 courses, for tightening the courses together vertically.

32
33 It may be noted that the log 39 which abuts the special-log 36 at
34 the corners is (apart from the simple-to-cut recess 43) not
35 itself special. The log 39 is provided simply with the common
36 end-face on both ends, just like the logs that make up the rest
37 of the length of the wall. In other words, all the specialness
38 needed at the corners is provided in and by the special log
39 itself.

40
41 Fig 5 shows the end-faces in the lower course being angled in the

opposite sense to the end-faces in the upper course. (Of course, the wall comprises many more courses, which are arranged alternately.) By contrast, Fig 2 shows the end-faces angled all in the same sense in successive courses. The problem with the end-faces in all the courses being angled in the same sense, as in Fig 2, is that, at the corners, the side-end-faces would all be in vertical alignment, which is not good.

When the courses shown in Fig 5 are brought together, very effective protection against water ingress is achieved. The spline 25 serves as a watershed, which deflects any water that might collect on the outside land 46 of the upper surface of the log. The first re-entrant platform 47 of the end-face 40 lies to the outside of the watershed formed by the spline 25.

The vicinity of the first re-entrant platform 47 is shown in close-up in Fig 6. Fig 6a shows the two logs separated. The manner of cutting the re-entrant platforms (as was described with reference to Fig 3) in fact leaves a slight undercut at 48, because of the set of the saw-teeth. Also, wood is a material that basically will not support a sharp edge, and so the point 49 is slightly rounded or chamfered. As a result, there are inevitably two small channels 50 formed when the logs are assembled together, at the vicinity of the first re-entrant platform (and any other re-entrant platforms). These channels serve to receive and collect any water that might enter the gap 52. Under driving rain conditions, water might penetrate forcefully into the gap 52, but once the water reaches the channels 50 its energy is spent, and the water now simply seeps down the channels. If desired, the channels can be purposely cut larger, by modifying the saw blades in Fig 3. However, it is recognised that the kind of channels 50 that arise naturally, with standard saw-blades, are adequate in most cases.

The bottom mouth of the channels 50 opens right onto the outside land 46 on the upper surface of the log below. The watershed prevents the water penetrating to the inside, and the water harmlessly emerges outwards from the land 46, and outside.

This system of placing the first re-entrant platform outside the watershed provides a very effective protection against water-

1 penetration. The labyrinth of surfaces and facets between the
2 logs also provides excellent protection against air penetration,
3 whereby any air that might leak through the wall has so little
4 energy that it can hardly give rise to a draft. The gaskets 42
5 provide extra draft and water protection at the corners.

6
7 Fig 7 shows how the system of placing the first re-entrant
8 platform outside the watershed can be put into effect even when
9 using large sheets of wood. The upper and lower surfaces of the
10 sheets are tented, as at 54, which serves as the watershed. The
11 end-edges 56 of the sheets have the complementary re-entrant
12 platforms, as previously described.

13
14 One of the problems with systems of interlocking edges of sheets
15 together can be that the sheets have to be slid into engagement
16 lengthwise, which can be very inconvenient. In the design as
17 shown, the sheets do not have to be assembled. In fact, the
18 sheets only interlock tightly upon final assembly into position,
19 and yet the joints are physically robust and secure, and weather
20 protection is excellent.

21 As to weather-proof sealing, in the configurations as shown the
22 logs can be expected to hold themselves together so tightly that
23 light caulking between the joints during assembly is all that is
24 needed to keep the joints weather-tight for many years.

25 Alternatively, gasket-retaining seal-grooves can be provided in
26 the logs at appropriate locations. Although more labour-
27 intensive during assembly, caulking is generally preferred over
28 gaskets, in that caulking can be inspected from outside the
29 finished wall, and caulking can be replaced, at least to some
30 extent, from outside the finished wall (which a gasket cannot).
31 The problem with caulking as a method of sealing the logs in
32 conventional log cabin construction has been that caulking cannot
33 cope with distortions that tend, over the years, to cause
34 separation of the logs, especially at the corners; but that
35 tendency is reduced to a minimum in the present design, whereby
36 caulking is more likely to be acceptable.

37
38 The scope of the invention is defined in the accompanying claims.
39 Figs 8a,8b,8c illustrate how the terminology used in the claims
40 applies to the depicted embodiment.
41

- 1 Fig 9 shows a prior art system for joining pieces of wood siding.
- 2 It will be noted that of course this system provides little
- 3 protection against water penetration.

Claims

1 CLAIM 1. A wall, comprising many pieces, arranged in horizontal
2 courses, one above another, wherein:
3 piece A has multi-faceted top and bottom surfaces TSA and BSA,
4 which are so shaped as to comprise lateral-interlocking-
5 means in combination with corresponding surfaces BSM of
6 piece M above and TSN of piece N below;
7 the lateral-interlocking-means between TSA and BSM, and between
8 BSA and TSN, when engaged, are such as to prevent the piece
9 A from moving laterally sideways relative to the piece M
10 above and the piece N below;
11 piece A has inside and outside opposing side-surfaces, ISA and
12 OSA, which lie respectively to the inside and the outside of
13 the wall of pieces;
14 the top surface TSN of piece N defines a top-watershed, TWN,
15 parallel to the longitudinal axis of piece N, in that no
16 facet of the top surface TSN lying to the outside of the
17 top-watershed TWN has an inwards-facing-component, and in
18 that a facet of the surface TSN lying to the inside of the
19 top-watershed TWN has an inwards-facing component;
20 piece A has opposing multi-faceted end-surfaces, LSA and RSA,
21 respectively at the left and right longitudinal ends of
22 piece A, LSA and RSA being so shaped as to comprise
23 longitudinal-interlocking-means in combination with
24 corresponding surfaces RSB of piece B to the left, and LSC
25 of piece C to the right;
26 the longitudinal-interlocking-means between LSA and RSB, and
27 between RSA and LSC, when engaged, are such as to prevent
28 the piece A from moving longitudinally relative to the
29 pieces B and C;
30 one of the facets of the multi-faceted end-surface LSA comprises
31 a re-entrant facet LSA-RE, which is re-entrant in the sense
32 that the facet LSA-RE has a component parallel to the
33 longitudinal axis of piece A, which is directed towards the
34 bulk of piece A;
35 the end-surface RSB of piece B that interlocks with LSA has a
36 corresponding re-entrant facet RSB-RE, which is re-entrant
37 in the sense that the facet RSB-RE has a component parallel
38 to the longitudinal axis of piece B, which is directed
39 towards the bulk of piece B;
40 the re-entrant facets LSA-RE and RSB-RE lie to the outside of the

41 top-watershed TWN of the surface TSN, between the top-
42 watershed TWN and the outside surface OSN of piece N;
43 whereby water present between the re-entrant facets LSA-RE and
44 RSB-RE, and seeping downwards, is directed by the top-
45 watershed TWN to the outside of piece N, and cannot pass to
46 the inside of piece N.

47 **CLAIM 2.** Wall of claim 1, wherein the pieces are pieces of wood.

48 **CLAIM 3.** Wall of claim 2, wherein the pieces are logs of a log
49 cabin structure, having a cross-sectional thickness between
50 about 10 and 20 cm, and a height between about 10 and 20 cm.

51 **CLAIM 4.** Wall of claim 2, wherein the pieces are pieces of
52 siding, having a cross-sectional thickness between about
53 1 and 2 cm, and a height between about 10 and 20 cm.

54 **CLAIM 5.** Wall of claim 2, wherein the pieces are pieces of
55 sheeting, having a cross-sectional thickness between about 1
56 and 2 cm, and a height of 100 cm or more.

57 **CLAIM 6.** Wall of claim 1, wherein the bottom surface BSA of
58 piece A defines a complementary bottom-watershed BWA.

59 **CLAIM 7.** Wall of claim 1, wherein:
60 the interlocking end-surfaces LSA and RSB fit together in nominal
61 touching contact over substantially the whole area thereof,
62 except as follows;
63 the interlocking end-surfaces LSA and RSB, in the vicinity of the
64 facets LSA-RE and RSB-RE are so configured as to define a
65 vertical channel therebetween, which extends over the height
66 of the piece A, and which is so positioned as to collect
67 water from between LSA-RE and RSB-RE;
68 the channel has an exit mouth at the bottom thereof, and the exit
69 mouth is so located as to conduct water emerging therefrom
70 onto a point on the top surface TSN of the piece N below,
71 which is outside of the top-watershed TWN.

72 **CLAIM 8.** Wall of claim 1, wherein the lateral-interlocking-means
73 between surfaces BSA and TSN comprises a spline formed on
74 TSN and a complementary groove formed in BSA, and the top-

75 watershed TWN comprises the top of the spline.

76 **CLAIM 9.** Wall of claim 1, wherein the lateral-interlocking-means
77 comprises two splines in TSN and two complementary grooves
78 in BSA, in parallel side-by-side relationship, and the top-
79 watershed TWN comprises the top of the spline nearest the
80 outside of the wall.

81 **CLAIM 10.** Wall of claim 1, wherein the pieces A and B are
82 interlocked but not dovetailed, in that:
83 the multi-faceted end-surface LSA is so configured that, in
84 respect of at least some points on LSA, lines drawn
85 horizontally, and at right angles to the axis of the piece
86 A, and emerging from the said points, emerge in a
87 directional sense that is directed towards the inside of the
88 wall;
89 the end-surface LSA is so configured that there is no point on
90 LSA in respect of which a line drawn parallel to the axis
91 and emerging from a point on LSA, emerges in a directional
92 sense that is directed towards the outside of the wall;
93 the multi-faceted end-surface RSB is so configured that, in
94 respect of at least some points on RSB, lines drawn
95 horizontally, and at right angles to the axis of the piece
96 A, and emerging from the said points, emerge in a
97 directional sense that is directed towards the outside of
98 the wall;
99 the end-surface RSB is so configured that there is no point on
100 RSB in respect of which a line drawn parallel to the axis
101 and emerging from a point on RSB, emerges in a directional
102 sense that is directed towards the inside of the wall.

103 **CLAIM 11.** Wall of claim 1, wherein the left end-surfaces LSA,
104 LSB, LSC, etc, of the pieces in a course are all of the same
105 configuration, and are of a complementary configuration to
106 the right end-surfaces RSA, RSB, RSC, etc.

107 **CLAIM 12.** Wall of claim 1, wherein the re-entrant facets LSA-RE
108 and RSB-RE are flat, planar, vertical, and parallel to each
109 other.

110 **CLAIM 13.** Wall of claim 1, wherein:

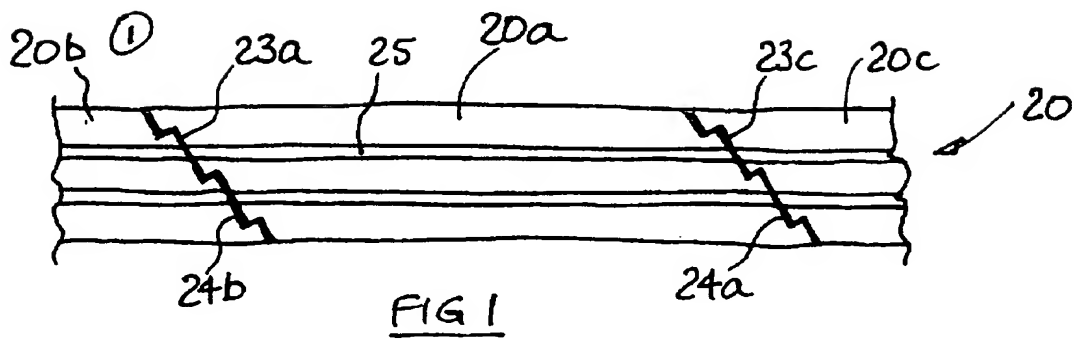
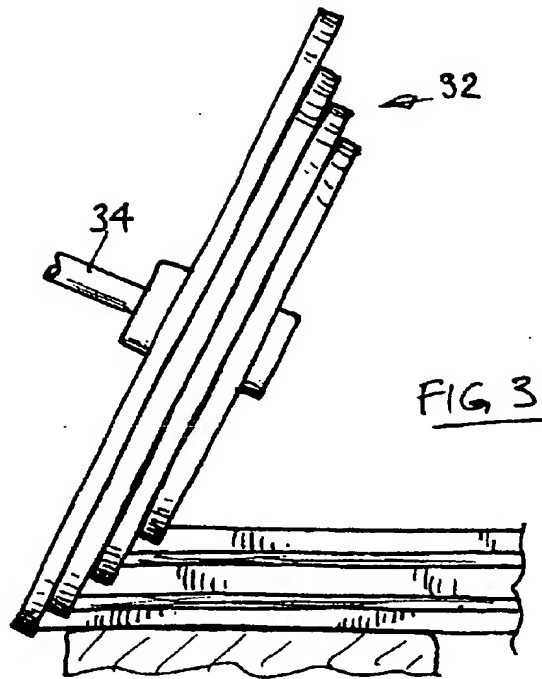
111 the left end-surface LSA of piece A includes a second re-entrant
112 facet, LSA-RE2, which is separate from LSA-RE;
113 the right end-surface RSB of piece B includes a complementary
114 second re-entrant facet, RSB-RE2, which is separate from
115 RSB-RE;
116 LSA-RE2 is separately flat, planar, vertical, and parallel to
117 LSA-RE, and is complementary to, and in interlocking
118 engagement with, RSB-RE2;
119 and LSA-RE2 and RSB-RE2 lie on the inside of the top-watershed of
120 piece N.

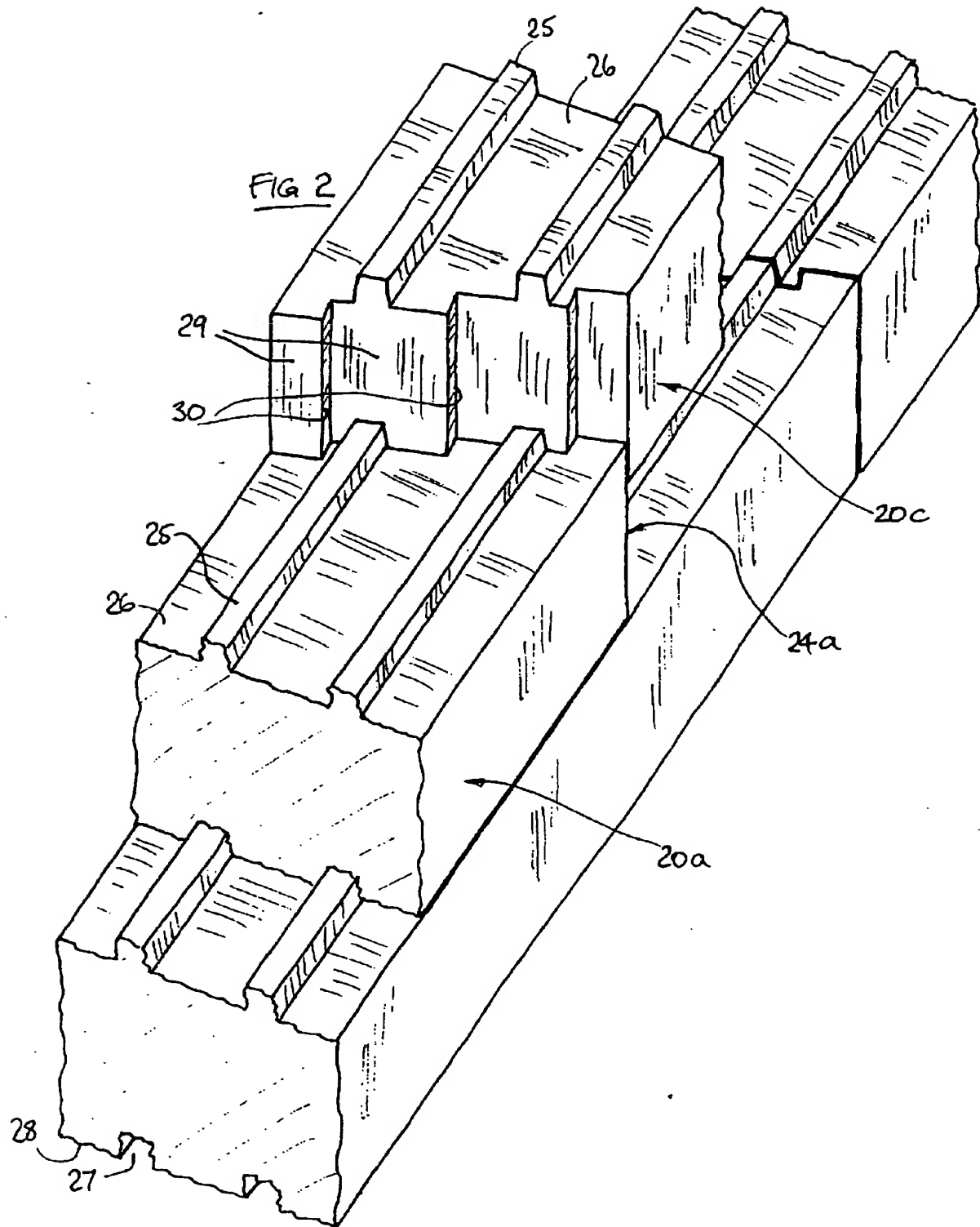
121 **CLAIM 14.** Wall of claim 13, wherein the re-entrant facets LSA-RE
122 and LSA-RE2 are separated from each other, and from the
123 side-surfaces OSA and ISA of piece A, by intercalated block-
124 facets of LSA;
125 the end-surface LSA is so configured that the block-facets of LSA
126 face away from the main bulk of the piece A.

127 **CLAIM 15.** Wall of claim 14, wherein the block-facets are
128 separated from each other, and are separately flat, planar,
129 vertical, and parallel to each other.

130 **CLAIM 16.** Wall of claim 15, wherein the block-facets of LSA lie
131 at right angles to the re-entrant-facet LSA-RE.

132 **CLAIM 17.** Wall of claim 1, wherein the wall includes a piece E,
133 and a piece F which is configured as a special corner piece;
134 the axis of the piece E lies at right angles to the axis of the
135 piece F, around a corner of the wall;
136 the piece E has an end-surface LSE, which corresponds to the end-
137 surface LSA of piece A;
138 the special-corner-piece F has a side-end-surface, which is
139 complementary to the end-surface LSE;
140 the side-end-face of the special-corner-piece F lies in
141 interlocking engagement with end-surface LSE of piece E.





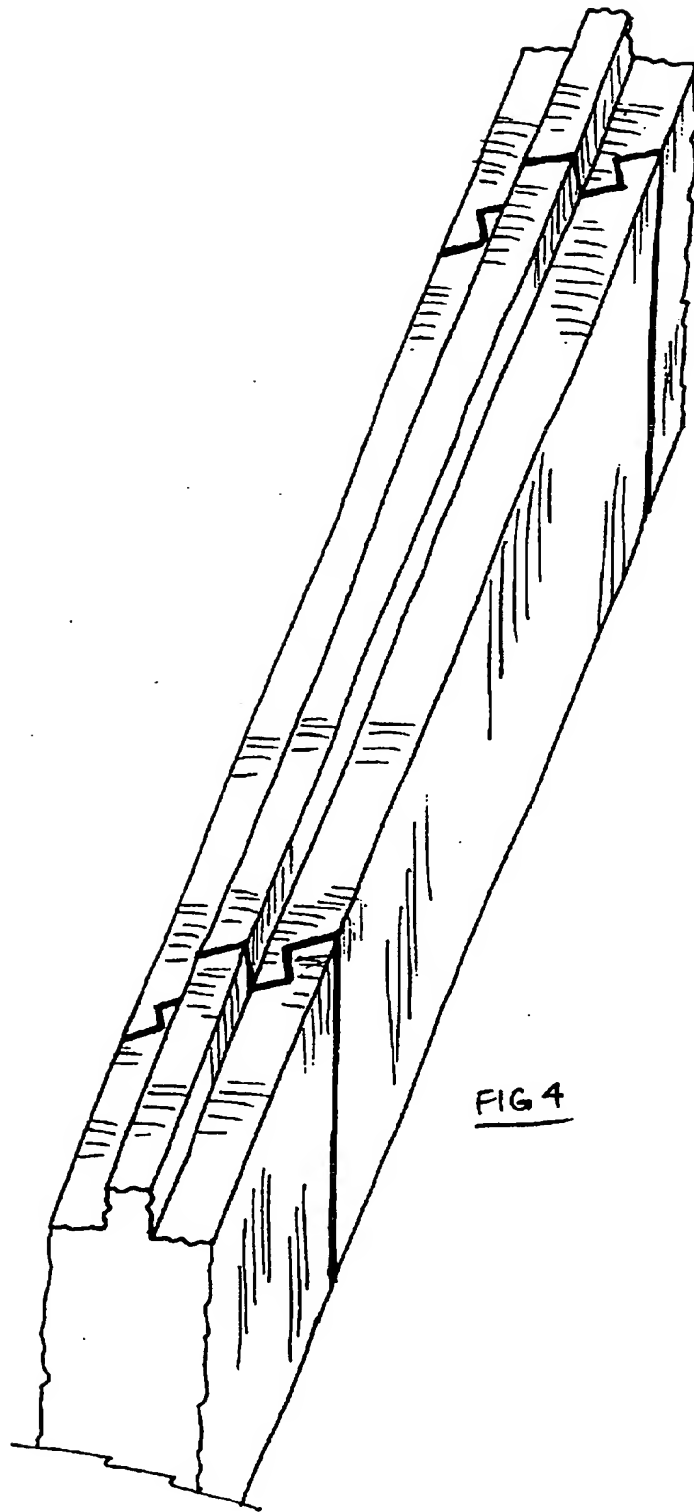


FIG 4

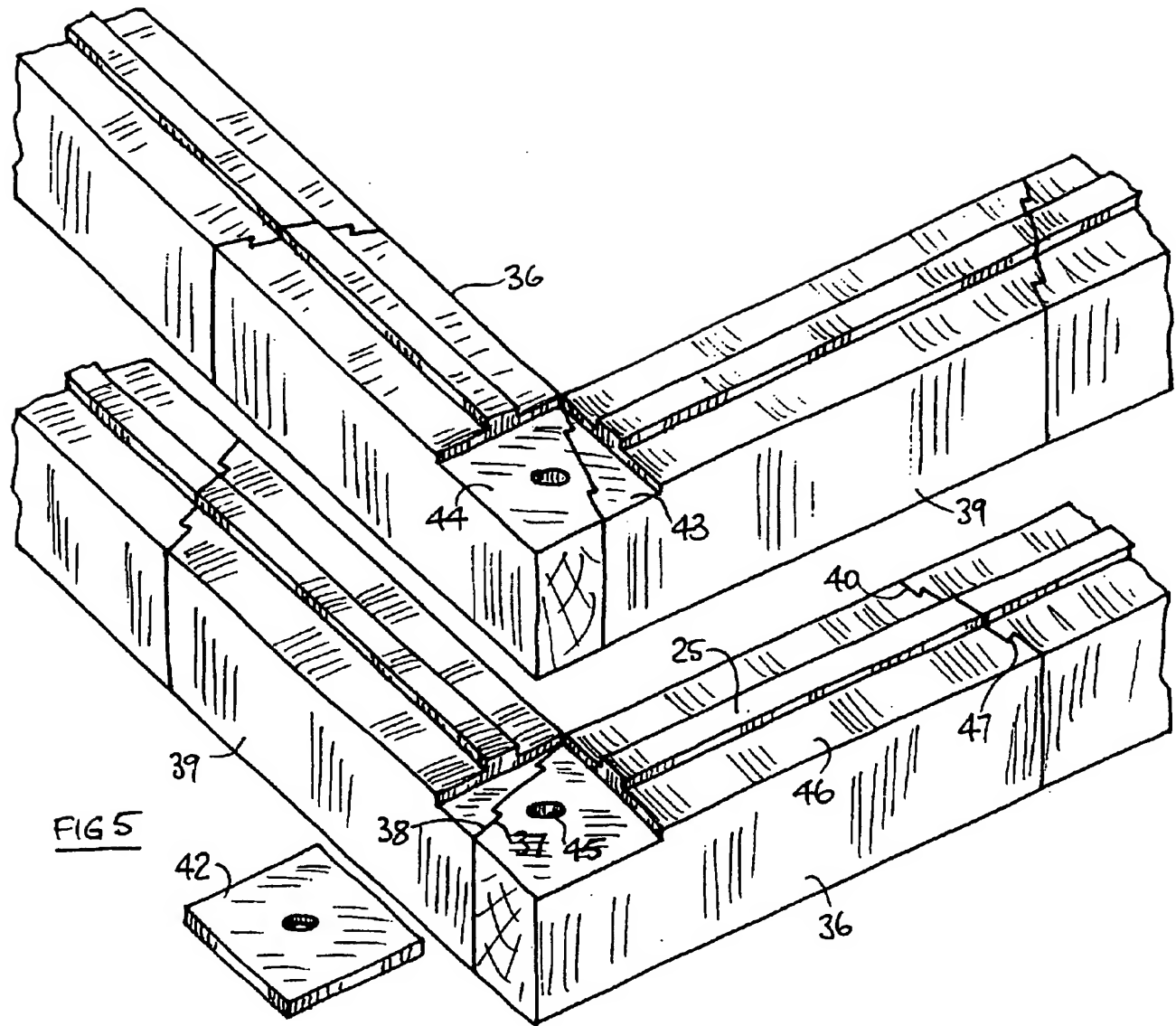


FIG 5

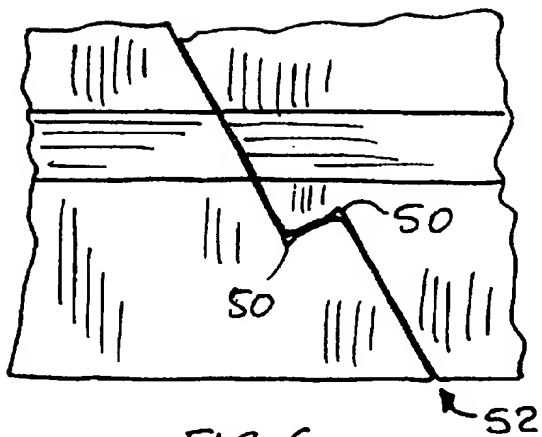
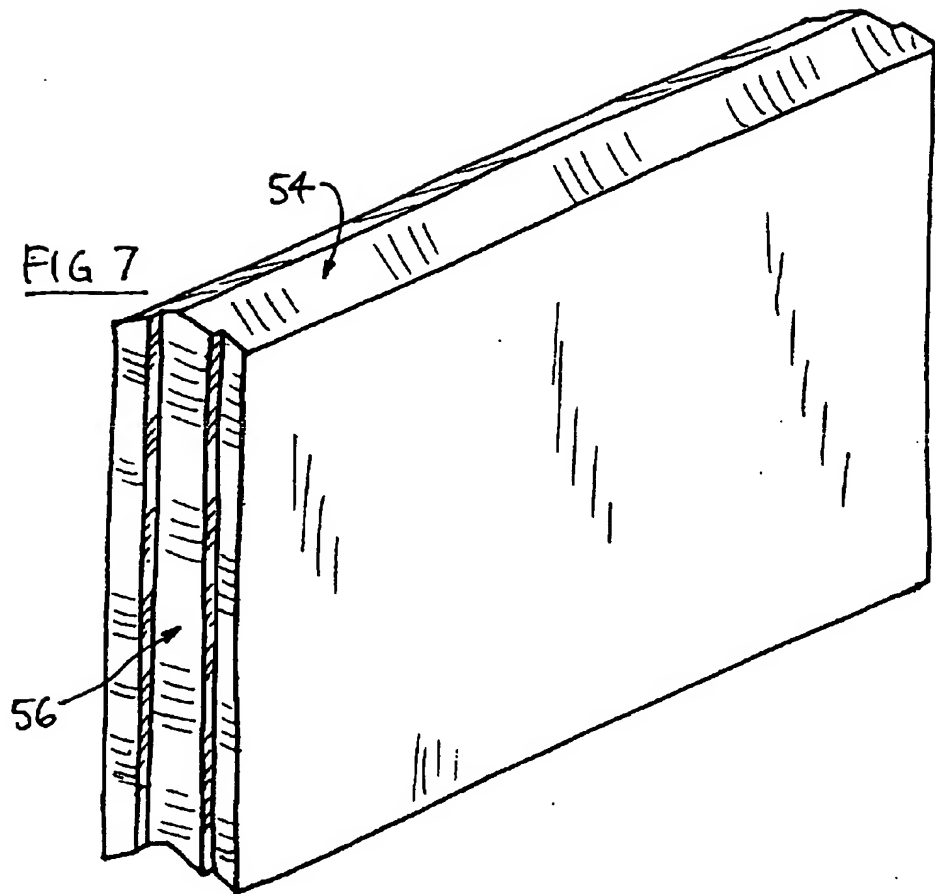


FIG 6

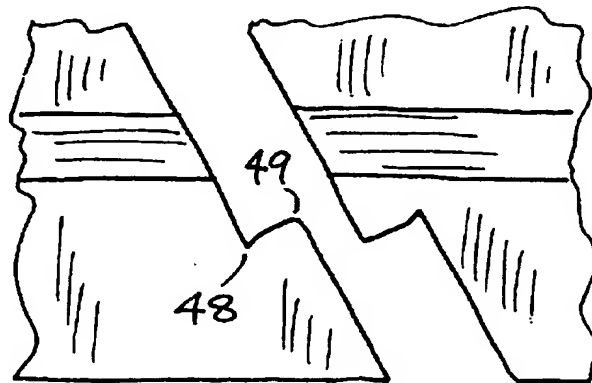
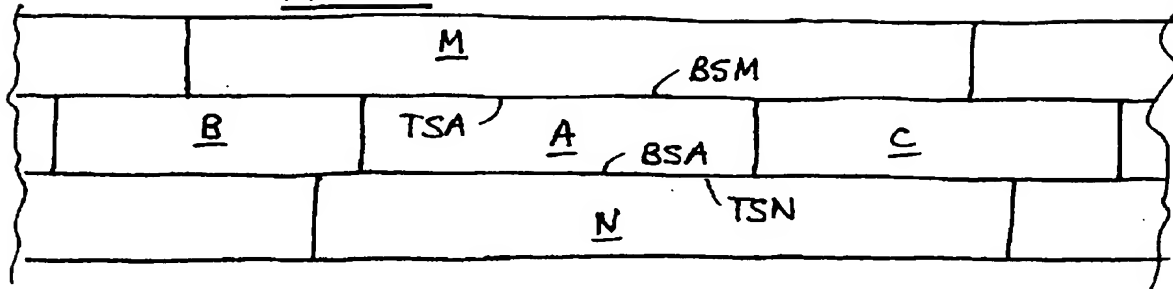
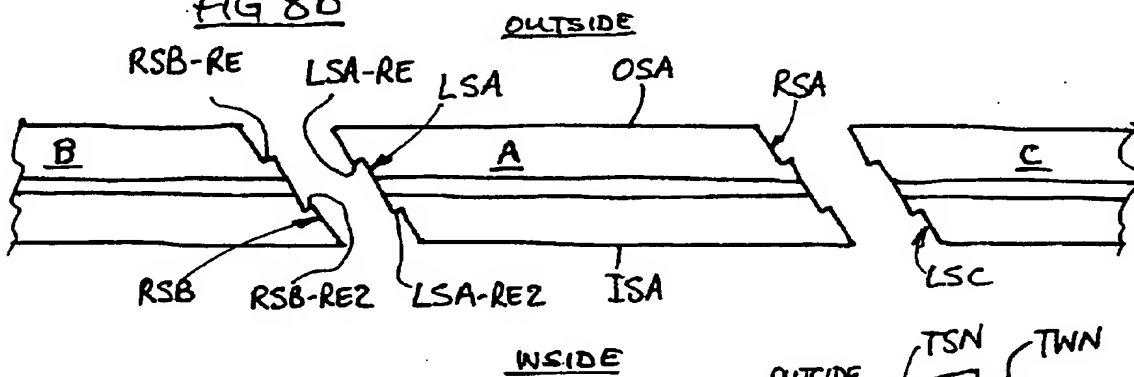
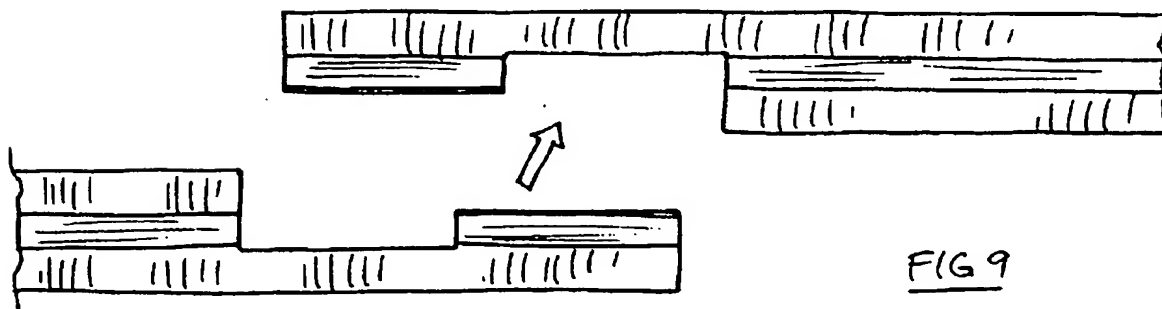
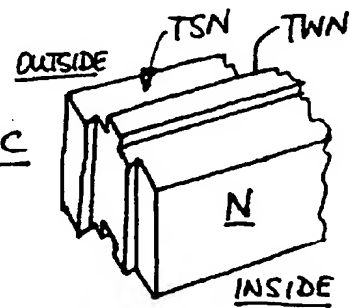


FIG 6a

FIG 8aFIG 8bFIG 8cFIG 9

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